

WHAT IS CLAIMED IS:

1. A zircon refractory material having a composition including the following elements:

5 ZrSiO₄ (98.75-99.68 wt%)
 ZrO₂ (0.01-0.15 wt%)
 TiO₂ (0.23-0.50 wt%)
 Fe₂O₃ (0.08-0.60 wt%).

10 2. The zircon refractory material of Claim 1, wherein said ZrSiO₄ includes a known amount of TiO₂ and Fe₂O₃ not counting said TiO₂ (0.23-0.50 wt%) and Fe₂O₃ (0.08-0.60 wt%).

15 3. The zircon refractory material of Claim 1, wherein a binder and a dispersant were added to batch materials including ZrSiO₄, ZrO₂, TiO₂ and Fe₂O₃ all of which are used to make said zircon refractory material wherein said binder and said dispersant were burned out during a
20 sintering process to form said zircon refractory material.

4. The zircon refractory material of Claim 3, wherein said binder (2.00-4.00%) is polyethylene glycol.

25 5. The zircon refractory material of Claim 3, wherein said dispersant (0.06-0.25%) is polyelectrolyte.

6. The zircon refractory material of Claim 3, wherein said dispersant (0.06-0.25%) is ammonium polymethacrylate and water.

5 7. The zircon refractory material of Claim 1, wherein said zircon refractory material has the following composition:

 ZrSiO₄ (98.75-99.65 wt%)
 ZrO₂ (0.02-0.15 wt%)
10 TiO₂ (0.23-0.50 wt%)
 Fe₂O₃ (0.10-0.60 wt%).

8. The zircon refractory material of Claim 1, wherein said zircon refractory material has the following
15 composition:

 ZrSiO₄ (98.95-99.55 wt%)
 ZrO₂ (0.03-0.15 wt%)
 TiO₂ (0.30-0.45 wt%)
20 Fe₂O₃ (0.12-0.45 wt%).

9. The zircon refractory material of Claim 1, wherein the zircon refractory material is used in a glass manufacturing system.

25 10. A method for producing a zircon refractory material, said method comprising the steps of:

 mixing a plurality of batch materials including:
 ZrSiO₄ (by difference)

ZrO₂ (0.01-0.15 wt%)

TiO₂ (0.23-0.50 wt%)

Fe₂O₃ (0.08-0.60 wt%); forming into a shape the
mixed batch materials; and

5 firing the shaped mixed batch materials to form said
zircon refractory material.

11. The method of Claim 10, wherein said step of
forming includes:

10 spray drying the mixed batch materials; and
pressing the spray dried batch materials to form the
shaped mixed batch materials.

12. The method of Claim 10, wherein said ZrSiO₄
15 includes a known amount of TiO₂ and Fe₂O₃ not counting said
batched TiO₂ (0.23-0.50 wt%) and Fe₂O₃ (0.08-0.60 wt%).

13. The method of Claim 10, wherein a binder and a
dispersant were added to batch materials including ZrSiO₄,
20 ZrO₂, TiO₂ and Fe₂O₃ all of which are used to make said
zircon refractory material wherein said binder and said
dispersant were burned out during a sintering process to
form said zircon refractory material.

25 14. The method of Claim 13, wherein said binder
(2.00-4.00%) is polyethylene glycol.

15. The method of Claim 13, wherein said dispersant (0.06-0.25%) is polyelectrolyte.

16. The method of Claim 13, wherein said dispersant
5 (0.06-0.25%) is ammonium polymethacrylate and water.

17. The method of Claim 10, wherein said zircon refractory material has the following composition:

ZrSiO₄ (by difference)
10 ZrO₂ (0.02-0.15 wt%)
TiO₂ (0.23-0.50 wt%)
Fe₂O₃ (0.10-0.60 wt%).

18. The method of Claim 10, wherein said zircon
15 refractory material has the following composition:

ZrSiO₄ (by difference)
ZrO₂ (0.03-0.15 wt%)
TiO₂ (0.30-0.45 wt%)
Fe₂O₃ (0.12-0.45 wt%).
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19. The method of Claim 10, wherein the zircon refractory material is used in a glass manufacturing system.

25 20. A glass manufacturing system comprising:
at least one vessel for melting batch materials; and
a forming vessel for receiving the melted batch materials and forming a glass sheet, wherein at least a

portion of said forming vessel is made from a zircon refractory material having a composition including the following elements:

5 ZrSiO₄ (by difference)
 ZrO₂ (0.01-0.15 wt%)
 TiO₂ (0.23-0.50 wt%)
 Fe₂O₃ (0.08-0.60 wt%).

21. The glass manufacturing system of Claim 20,
10 wherein said at least one vessel includes a melting, fining, mixing or delivery vessel.

22. The glass manufacturing system of Claim 20,
wherein said ZrSiO₄ includes a known amount of TiO₂ and Fe₂O₃
15 not counting said batched TiO₂ (0.23-0.50 wt%) and Fe₂O₃ (0.08-0.60 wt%).

23. The glass manufacturing system of Claim 20,
wherein a binder and a dispersant were added to batch
20 materials including ZrSiO₄, ZrO₂, TiO₂ and Fe₂O₃ all of which are used to make said zircon refractory material wherein said binder and said dispersant were burned out during a sintering process to form said zircon refractory material.

25 24. The glass manufacturing system of Claim 23, wherein said binder is polyethylene glycol.

25. The glass manufacturing system of Claim 23,
wherein said dispersant is polyelectrolyte.

26. The glass manufacturing system of Claim 23,
5 wherein said dispersant is ammonium polymethacrylate and
water.

27. The glass manufacturing system of Claim 20,
wherein said zircon refractory material has the following
10 composition:

ZrSiO₄ (by difference)
ZrO₂ (0.02-0.15 wt%)
TiO₂ (0.23-0.50 wt%)
Fe₂O₃ (0.10-0.60 wt%).

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28. The glass manufacturing system of Claim 20,
wherein said zircon refractory material has the following
composition:

20 ZrSiO₄ (by difference)
ZrO₂ (0.03-0.15 wt%)
TiO₂ (0.30-0.45 wt%)
Fe₂O₃ (0.12-0.45 wt%).

29. A glass sheet formed by a glass manufacturing
25 system that includes:

at least one vessel for melting batch materials and
forming molten glass; and

an isopipe for receiving the molten glass and forming the glass sheet, wherein at least a portion of said isopipe is made from a zircon refractory material having a composition with at least the following elements:

- 5 ZrSiO₄ (98.75-99.68 wt%)
 ZrO₂ (0.01-0.15 wt%)
 TiO₂ (0.23-0.50 wt%)
 Fe₂O₃ (0.08-0.60 wt%).

10 30. The glass sheet of Claim 29, wherein said at least one vessel includes a melting, fining, mixing or delivery vessel.

15 31. The glass sheet of Claim 29, wherein said ZrSiO₄ includes a known amount of TiO₂ and Fe₂O₃ not counting said batched TiO₂ and Fe₂O₃.

20 32. The glass manufacturing system of Claim 29, wherein a binder and a dispersant were added to batch materials including ZrSiO₄, ZrO₂, TiO₂ and Fe₂O₃ all of which are used to make said zircon refractory material wherein said binder and said dispersant were burned out during a sintering process to form said zircon refractory material.

25 33. The glass sheet of Claim 32, wherein said binder is polyethylene glycol.

34. The glass sheet of Claim 32, wherein said dispersant is polyelectrolyte.

35. The glass sheet of Claim 32, wherein said
5 dispersant is ammonium polymethacrylate and water.

36. The glass sheet of Claim 29, wherein said zircon refractory material has the following composition:

10 ZrSiO₄ (98.75-99.65 wt%)
 ZrO₂ (0.02-0.15 wt%)
 TiO₂ (0.23-0.50 wt%)
 Fe₂O₃ (0.10-0.60 wt%).

37. The glass sheet of Claim 26, wherein said zircon
15 refractory material has the following composition:

 ZrSiO₄ (98.95-99.55 wt%)
 ZrO₂ (0.03-0.15 wt%)
 TiO₂ (0.30-0.45 wt%)
 Fe₂O₃ (0.12-0.45 wt%).

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